

(12) UK Patent Application (19) GB (11) 2 367 531 (13) A

(43) Date of A Publication 10.04.2002

(21) Application No 0117331.9

(22) Date of Filing 16.07.2001

(30) Priority Data

(31) 12216250

(32) 17.07.2000

(33) JP

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(51) INT CL⁷

H01H 9/04 13/06

(52) UK CL (Edition T)

B6F FCHK

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(58) Field of Search

UK CL (Edition T) B6F FCHK

INT CL⁷ H01H 9/04 13/06

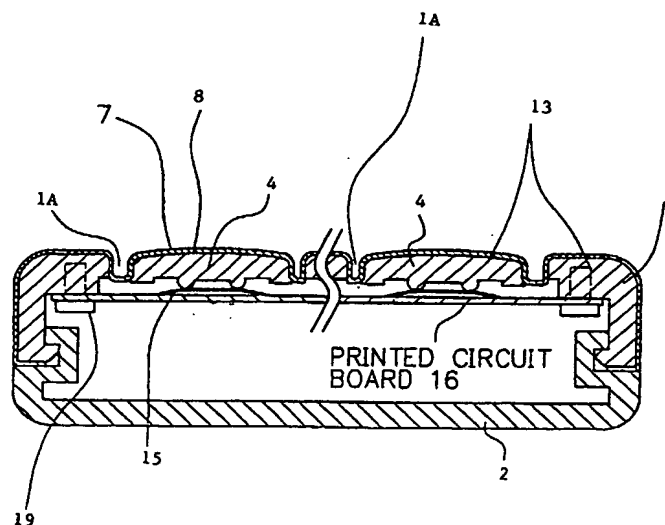
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(54) Abstract Title

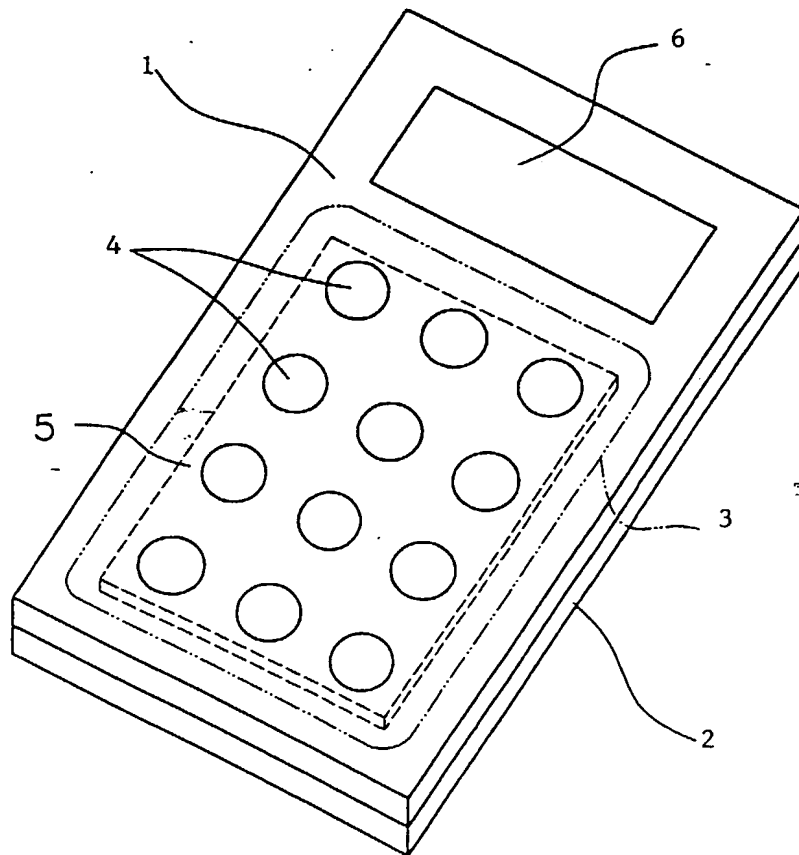
Keypad having a resin film continuously formed over the surfaces of keys therein and a surrounding cabinet to cover a gap between the cabinet and the keys

(57) The keypad includes operation keys 4, upper and lower cabinets 1,2, and a resin film 7 which covers the surface of the upper cabinet 1 and the surfaces of the keys such that the film is formed continuously on the surfaces of the cabinet and the operation keys. The film covers a gap between the cabinet and the operation keys, and gaps formed among the operation keys. The resin film prevents water and dust from damaging a printed circuit board 16. The resin film may have indicia 8 printed thereon before incorporation into the keypad. The keypad may include a transparent LCD display (20, Fig. 8) wherein the part of the resin film (7a) which covers the display is also transparent. The keypad may be used in a wide variety of electronic instruments, for example a telephone terminal, or a portable calculator. A method of manufacturing the keypad using first and second core plates is also disclosed (Fig. 9).

FIG. 7

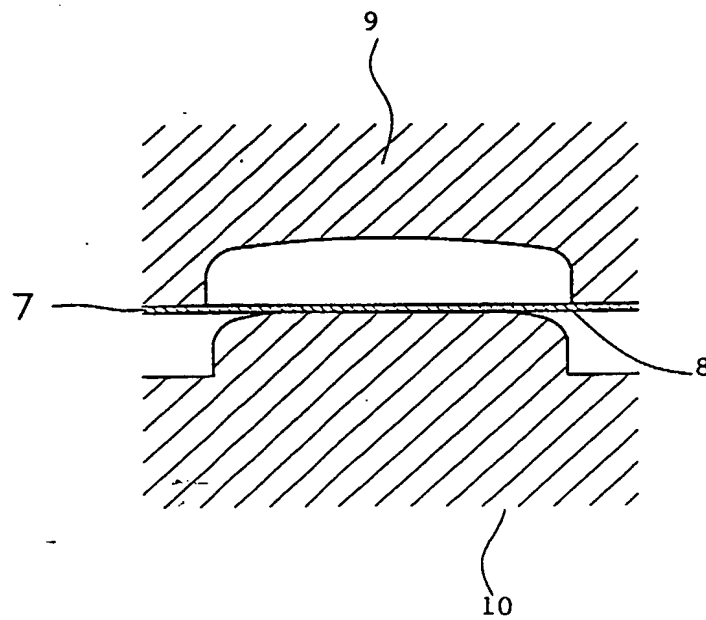


F I G. 1 PRIOR ART



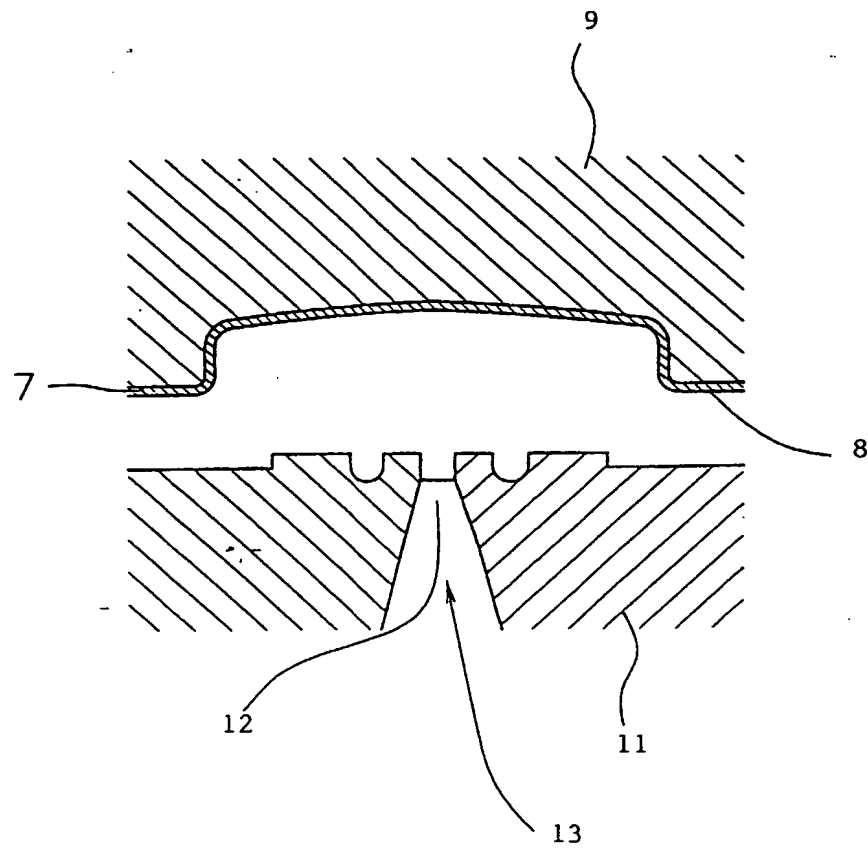
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F I G. 2 PRIOR ART



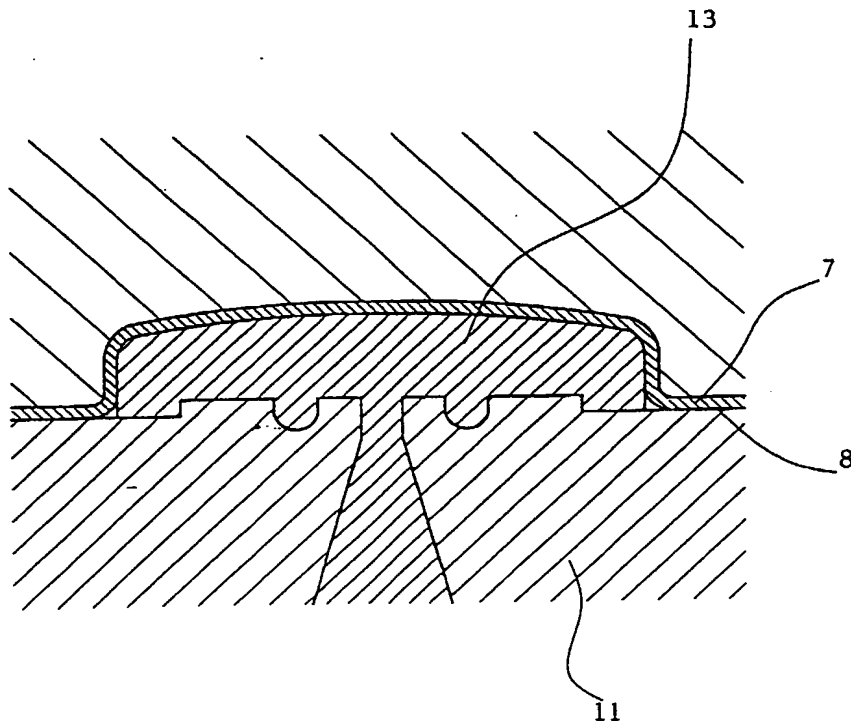
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F I G. 3 PRIOR ART



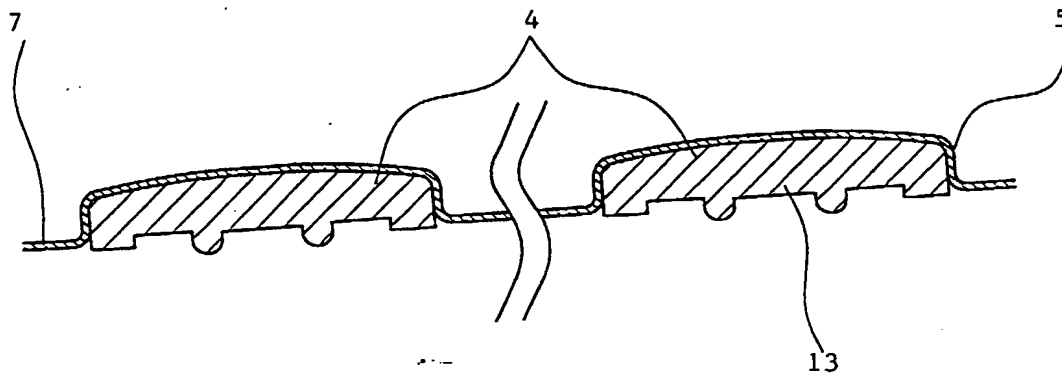
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F I G. 4 PRIOR ART

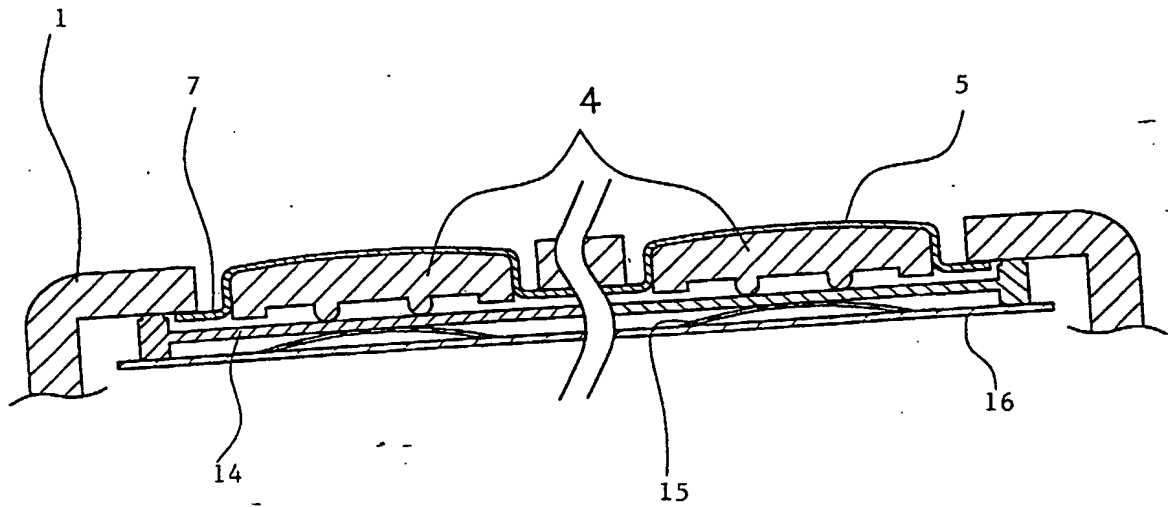


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F I G. 5 PRIOR ART



F I G. 6 PRIOR ART



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FIG. 7

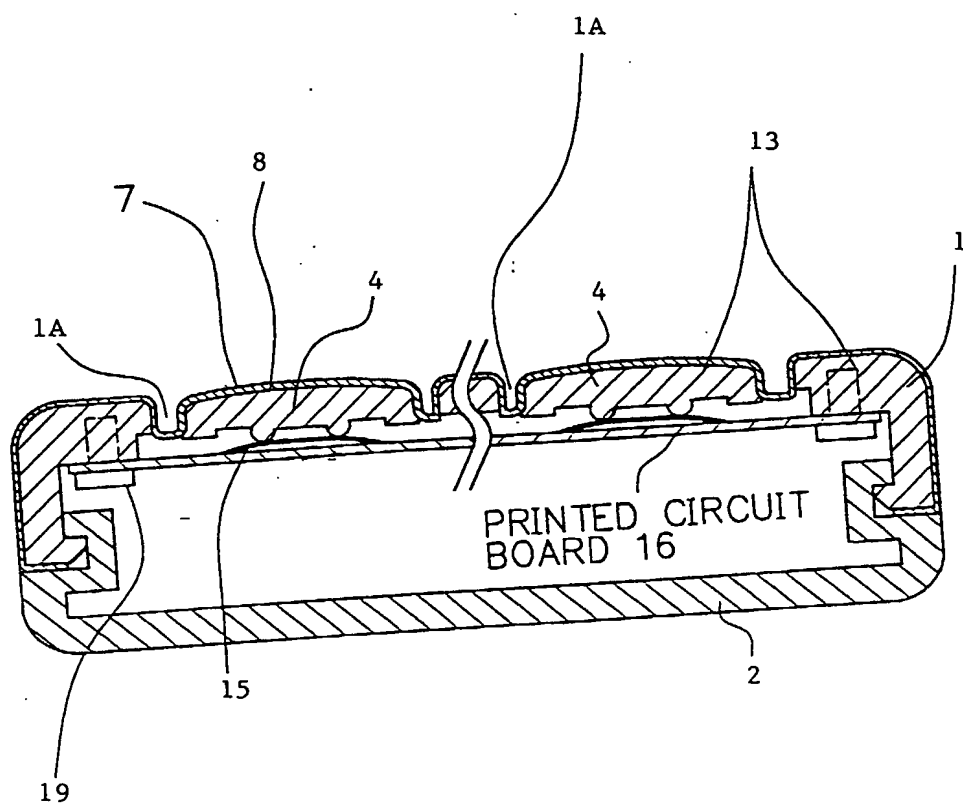
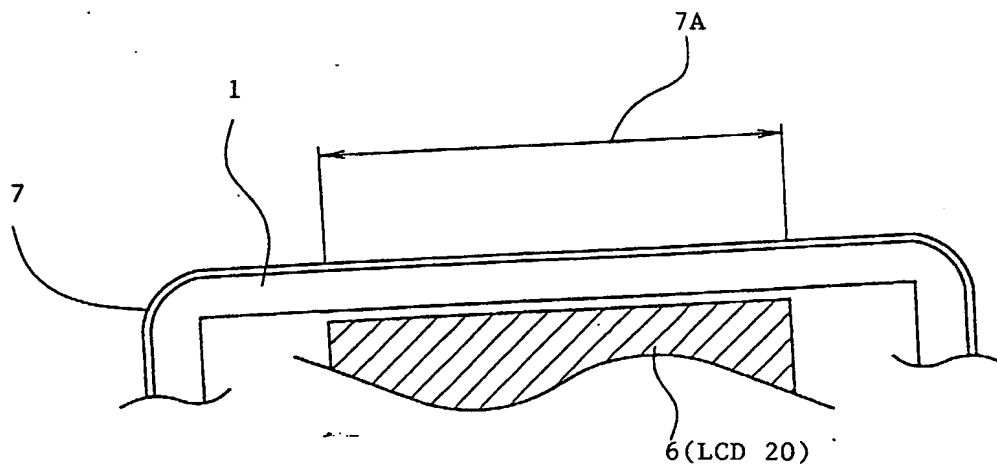
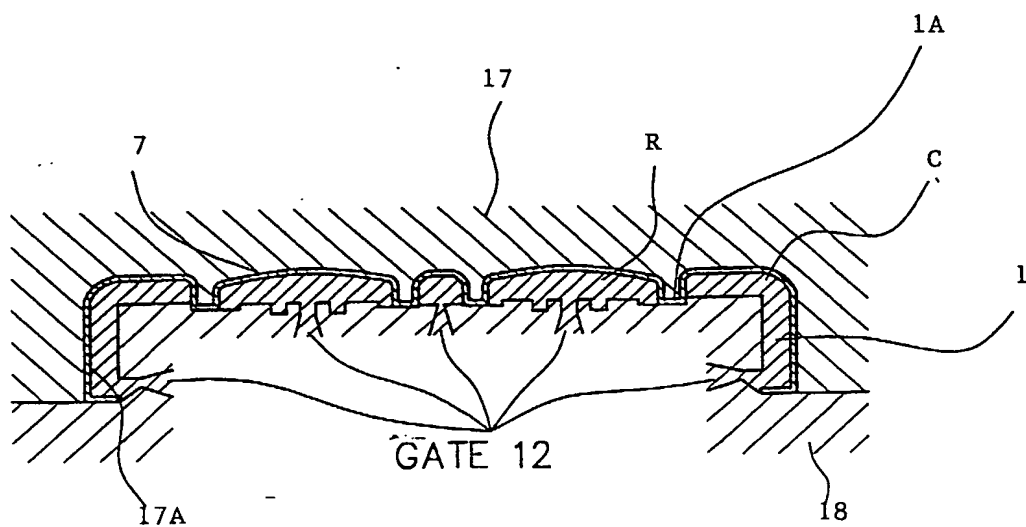


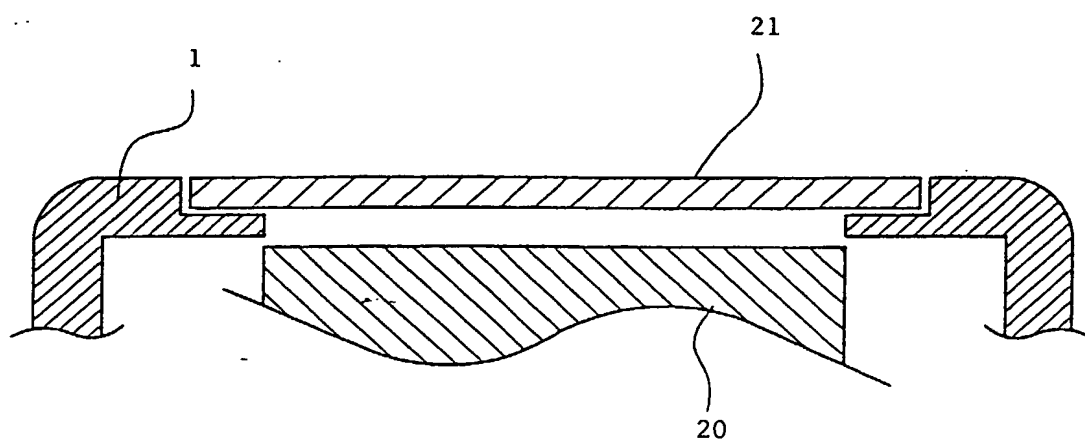
FIG. 8



F I G. 9



F I G. 10 PRIOR ART



STRUCTURE OF ELECTRONIC INSTRUMENT
HAVING OPERATION KEYS
AND MANUFACTURING METHOD THEREOF

BACKGROUND OF THE INVENTION

The present invention relates to a structure of an electronic instrument having operation keys for, such as a telephone terminal or a portable calculator, and a manufacturing method thereof.

5 Description of the Related Art

Fig. 1 is a perspective view showing a conventional structure of an electronic instrument having operation keys. As shown in Fig. 1, the conventional structure of the electronic instrument provides an upper cabinet 1 and a lower cabinet 2 both formed by resin molding, operation
10 keys 4 in an operating section 3, and a displaying section 6. And a key sheet 5 is composed of that the operation keys 4 are connected with a resin film covering the upper surfaces of the operation keys 4 one another.

Next, a manufacturing method of the key sheet 5 is explained.

15 Fig. 2 is a sectional view showing a first manufacturing process of the key sheet 5 at the conventional structure of the electronic instrument shown in Fig. 1. First, a resin film 7, whose printing surface 8 designated images and figures were printed on, is put between an upper die 9 having the same shape surface that the cosmetic design surfaces of
20 the operation keys 4 have and a first lower die 10 that has the shape reversed the upper die 9 and that the thickness of the resin film 7 is offset, and pressure is applied to the upper die 9 and/or the first lower die 10, and the resin film 7 is formed. In this, the resin film 7 is made of a thermoplastic resin material such as polyester, nylon, and polycarbonate,
25 and the thickness of the resin film 7 is 50 micrometers to 100 micrometers.

Fig. 3 is a sectional view showing a second manufacturing process of the key sheet 5 at the conventional structure of the electronic instrument shown in Fig. 1. After the first manufacturing process mentioned above, as shown in Fig. 3, the first lower die 10 is replaced by
 5 a second lower die 11 whose upper surface matches the bottom surfaces of the operation keys 4, and a filler resin 13 such as an ABS resin and polycarbonate is injected from a gate 12 formed at the second lower die 11. Fig. 4 is a sectional view showing a third manufacturing process of the key sheet 5 at the conventional structure of
 10 the electronic instrument shown in Fig. 1. As shown in Fig. 4, the space between the printing surface 8 of the resin film 7 and the second lower die 11 is filled with the filler resin 13, after the filler resin 13 was hardened, both of the upper die 9 and the second lower die 11 are removed. Fig. 5 is a sectional view of the key sheet 5 of the
 15 conventional structure of the electronic instrument. As shown in Fig. 5, the key sheet 5 with the operation keys 4 is formed.

Fig. 6 is a sectional view showing a structure of the operating part of the conventional structure of the electronic instrument. As shown in Fig. 6, the operating part of the conventional structure consists
 20 of the upper cabinet 1, the key sheet 5 with the operation keys 4, a rubber sheet 14, dome shaped switches 15, and a printed circuit board (PCB) 16.

In the operating part of the conventional structure, the reason why the rubber sheet 14 is inserted between the key sheet 5 with the operation keys 4 and the PCB 16 is to prevent the PCB 16 and the dome
 25 shaped switches 15 from being corroded by that water and/or dust enter from a gap between the upper cabinet 1 and the key sheet 5.

In the conventional structure of the electronic instrument, as shown in Fig. 6, the key sheet 5 with the operation keys 4, which was
 30 formed by that the filler resin 13 was filled under the resin film 7, is set

into the opening part of the upper cabinet 1.

However, in the conventional structure of the electronic instrument, there is a possibility that water and/or dust enter the inside of the electronic instrument from the gap between the key sheet 5 with the operation keys 4 and the upper cabinet 1. Therefore, the rubber sheet 14 is inserted between the key sheet 5 with the operation keys 4 and the PCB 16 to which the dome shaped switches 15 were mounted, and the water and/or dust are prevented from entering the inside of the electronic instrument. However, the key sheet 5 with the operation keys 4 is set into the opening part of the upper cabinet 1 in the state that the key sheet 5 with the operation keys 4 only presses the PCB 16, therefore, the water and/or the dust can not be entirely prevented from entering the inside of the electronic instrument. Furthermore, the number of the components is too large, and must be reduced in order to meet that the electronic instrument is small (thin) sized and light weight.

SUMMARY OF THE INVENTION

Specific embodiments of the present invention provide a structure of an electronic instrument having operation keys and a manufacturing method thereof, in which a dustproof and waterproof function can be secured by a simple structure.

In a first embodiment of the present invention, there is provided a structure of an electronic instrument having operation keys. The structure of the electronic instrument having operation keys provides a cabinet providing an opening part for operation keys, operation keys that are disposed in the opening part of the cabinet so that each of the operation keys is movable in the orthogonal direction to the front surface of the cabinet, and a resin film that covers the surface of the cabinet and the surfaces of

the operation keys in the state that the resin film is not cut on the surfaces of the cabinet and the operation keys, and covers a gap formed between the cabinet and the operation keys, and gaps formed among the operation keys.

5 In a further embodiment,
designated images and figures are printed on the surface
contacting the cabinet and the operation keys of the resin film.

 In a further embodiment, the cabinet
is divided into an upper cabinet and a lower cabinet
10 and composed of the upper cabinet and the lower cabinet, and the
operation keys are disposed in an opening part of the upper cabinet, and
the edge part of the resin film is extended to the part where the upper
cabinet and the lower cabinet are joined.

 In a further embodiment, the cabinet
15 provides a displaying part and the displaying
part is at least transparent, and the part of the resin film where the
displaying part is disposed is transparent.

 In a further embodiment, the upper
cabinet provides a displaying part and the displaying
20 part is at least transparent, and the part of the resin film where the
displaying part is disposed is transparent.

 In a further embodiment, a printed
circuit board in which switches contacting to each of the
operation keys are mounted is provided in the cabinet.

25 In a further embodiment, there is
provided a manufacturing method of an electronic instrument having
operation keys. In the manufacturing method of the electronic
instrument having operation keys, the electronic instrument having
operation keys provides a cabinet providing an opening part for operation
30 keys, and operation keys that are disposed in the opening part of the

cabinet so that each of the operation keys is movable in the orthogonal direction to the front surface of the cabinet, and a resin film is formed on a cavity plate having concave parts being the same shape as the outer shape of the cabinet and the outer shape of the operation keys at the state that the operation keys are disposed at the designated positions in the opening part of the cabinet by using a first core plate having convex parts (the concave parts are reversed and the thickness of the resin film is reduced) being the similar figure of the concave parts of the cavity plate by applying pressure. And after this, the first core plate is replaced with a second core plate, and empty spaces are formed between the cavity plate and the second core plate, and a resin material is filled in the empty spaces, and the cabinet and the operation keys are formed by the resin material, and a gap formed between the cabinet and the operation keys is covered with the resin film, and gaps formed among the operation keys are covered with the resin film.

In a further embodiment, designated images and figures are printed on the surface contacting to the cabinet and the operation keys of the resin film before the resin film is formed on the cavity plate.

In a further embodiment, the cabinet and the operation keys are formed by an injection molding when the resin material is injected into the empty spaces.

In a further embodiment, there is provided a manufacturing method of an electronic instrument having operation keys. The manufacturing method of the electronic instrument having operation keys provides the steps of: placing a cavity plate having concave parts being the same shape of the outer shape of an upper cabinet and the outer shape of operation keys at the state that the operation keys are disposed at designated positions in an opening part of

the upper cabinet, placing a resin film on the inside surface of the cavity plate in the state that the resin film is extended to the edge part of the cavity plate, placing a first core plate having convex parts (the concave parts are reversed and the thickness of the resin film is reduced) being the similar figure of the concave parts of the cavity plate on the resin film, and applying pressure to the resin film in the direction of the cavity plate through the first core plate, and forming the resin film on the cavity plate, removing the first core plate, placing a second core plate in the state that the second core plate faces with the resin film with empty spaces between the resin film and the second core plate, injecting a resin material from gates of the second core plate into the empty spaces, and removing the second core plate. And the upper cabinet and the operation keys are formed by the resin material, in the state that a gap formed between the upper cabinet and the operation keys is covered with the resin film, and gaps formed among the operation keys are covered with the resin material, and in the state that the resin film is extended to the part where the upper cabinet is fixed with a lower cabinet of the electronic instrument on the surface of the upper cabinet.

In a further embodiment, the manufacturing method of the electronic instrument having operation keys further provides the step of printing designated images and figures on the surface contacting to the upper cabinet and the operation keys of the resin film before the resin film is formed on the cavity plate.

BRIEF DESCRIPTION OF THE DRAWINGS

Specific embodiments of the present invention will become more apparent from consideration of the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view showing a conventional structure of an electronic instrument having operation keys;

Fig. 2 is a sectional view showing a first manufacturing process of a key sheet at the conventional structure of the electronic instrument
5 shown in Fig. 1;

Fig. 3 is a sectional view showing a second manufacturing process of the key sheet at the conventional structure of the electronic instrument shown in Fig. 1;

Fig. 4 is a sectional view showing a third manufacturing
10 process of the key sheet at the conventional structure of the electronic instrument shown in Fig. 1;

Fig. 5 is a sectional view of the key sheet at the conventional structure of the electronic instrument;

Fig. 6 is a sectional view showing a structure of the operating
15 part at the conventional structure of the electronic instrument;

Fig. 7 is a sectional view showing a structure of an embodiment of an electronic instrument having operation keys embodying the present invention;

Fig. 8 is a sectional view showing a structure of the displaying
20 part of the electronic instrument at the embodiment embodying the present invention;

Fig. 9 is a sectional view showing a manufacturing method at the structure of the embodiment of the electronic instrument embodying the present invention; and

Fig. 10 is a sectional view showing the part fixing an LCD to
25 the conventional electronic instrument.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, an embodiment of the present
30 invention is explained in detail. In this, the same reference number

used at the conventional structure is used in the structure of the present invention, at the case that the function is the same between them.

Fig. 7 is a sectional view showing a structure of an embodiment of an electronic instrument having operation keys of the present invention. As shown in Fig. 7, the structure of the embodiment of the electronic instrument having operation keys

provides an upper cabinet 1, a lower cabinet 2, and operation keys 4 that are disposed in an opening part 1a formed at the upper cabinet 1 in the state that each of the operation keys 4 is movable in the orthogonal direction to the front surface of the upper cabinet 1. And